Aircraft radar station TsD-ZOT

To exclude the operation of the SHARU of the TsD-33 receiver by its own reflected impulses from distant targets, it is launched by a wobbled pulse taken from the 25L12 blocking generator. The blocking generator is started from fantastron 25L11. The duration of the phantastron pulse is modulated with a voltage of 380-900 Hz.

6. DEVICE FOR FORMATION AND STABILIZATION OF CODE SIGNALS FOR PRODUCT

To ensure projectile control during automatic target tracking, the device for generating and stabilizing code signals creates reference signals in the form of paired high-frequency pulses generated by the transmitter at the moment the scanning beam of the antenna passes the top-right-bottom-left position relative to the aircraft axes.

Before proceeding to the analysis of the functional diagram of the device for the formation and stabilization of code signals, it is advisable to understand the principle of flight control of the RS-2-U missile, which is armed with a fighter-interceptor. The flight control principle of the RS-2-U missile is illustrated in Fig. 7 and is as follows.

The station TsD-ZOT, which is on board the aircraft, creates an equisignal line in space along which the rocket is directed to the target. When the missile deviates from the equal-signal line, the on-board radio equipment for controlling the RS-2-U missile generates control currents. The magnitude of the control currents is proportional to the modulation depth of the received radio signal and determines the amount of rudder deflection by the steering gears of the control and stabilization equipment.

The distribution of control currents along the control channels and the polarity of the current in each channel depends on the direction in which the rocket deviated from the equisignal line. The data allowing to judge the direction of the missile departure from the equal-signal line are contained in the structure of the radio signal itself and are disclosed by onboard radio equipment by decoding it.

The radio signal of the TsD-ZOT station consists of a sequence of radiated radio pulses. Among the main series of single pulses, the station's scanning system emits four paired pulses in one revolution, the so-called code pairs - one through every quarter of an antenna revolution. In fig. 7 digits 1,2,3,4 indicate the position of the beam at the moment of emission of the 1st, 2nd, 3rd and 4th code pairs, respectively. Code pairs differ from each other by the time interval between pulses in a pair. The moments of emission of code pairs correspond to a strictly defined position in space of the station beam. On their basis, the onboard radio equipment forms the reference voltages necessary for generating control signals in azimuth and elevation.

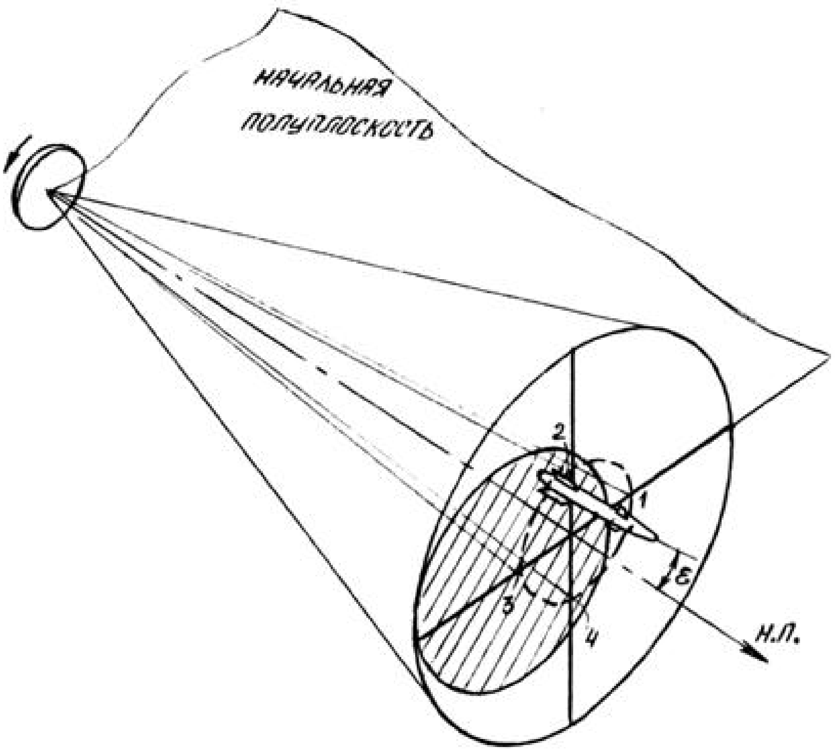


Рис. 7 Принцип управления полетом ракеты РС-2У

The structure of the radio beam of the TsD-30T station is shown in Fig. 8.

The left half-plane in flight, in which the axis of the scanning beam lies at the moment of emission of the 1st code pair, is taken as the initial one. The phase angle φ of the modulation envelope of the radio signal arriving at the rocket antenna is measured from it. The value of φ is measured clockwise when viewed in flight - in the direction of the beam rotation. In fig. 8 shows a graph of the radio signal received by the rocket. As can be seen from the graph, the 1st code pair - in accordance with the rocket position shown in the figure - is shifted by an angle φ from the maximum of the modulation envelope of the received radio signal.

The device for the formation and stabilization of code signals includes the following blocks participating in the work:

· Block of protection against impulse noise, issuing start pulses;

· A synchronizer that issues coded synchronization pulses;

· A transmitter that emits coded high-frequency pulses;

· A system that emits high-frequency transmitter pulses and provides reference voltages for generating code signals;

· Stabilization unit, providing stabilization of the antenna reference voltage;

· Junction box, which provides switching during the operation of the units.

In fig. 9 shows a functional diagram of a device for generating and stabilizing code signals.

The binding of the signal codes to the corresponding spatial position of the scanning beam of the antenna is provided with the help of the reference voltages issued by the reference voltage generator. The GON is installed on the antenna and is rigidly connected through a 1: 1 gear transmission to the antenna feed. The voltage reference generator produces two sinusoidal voltages offset by 90 °. These voltages are fed to the rotor of the rotating transformer (VT) of the reference voltage stabilization unit.

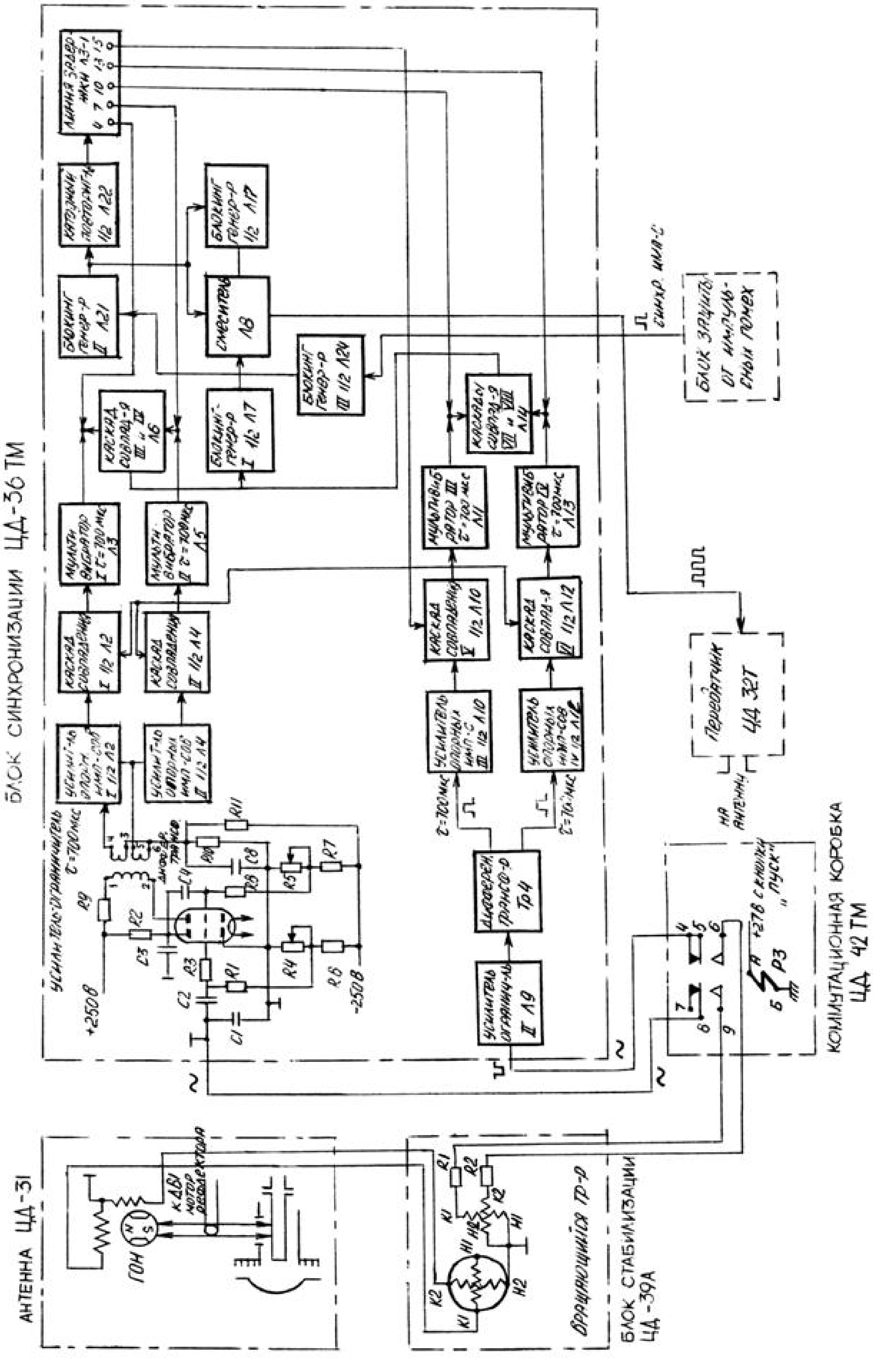
Rotop VT is mounted on the axis of the outer frame of the gyroscope, the stator is in the stabilization unit body, rigidly connected to the axes of the aircraft. In fig. 9 shows a kinematic diagram of the stabilization of reference voltages, and the voltage diagrams of the channel for the formation of code pulses are shown in Fig. ten.

At the moment of launching the rocket, a voltage of + 27V is applied to the electromagnet, which retracts the lever, releasing the cone, pushers and thereby causing the outer and inner frame of the gyroscope to become loose. Thus, the VT stator rigidly connected to the aircraft axes will rotate relative to the uncaged rotor when the aircraft rolls, keeping the phase of the reference sinusoidal voltage coming from the GON antenna in aircraft coordinates relative to the launch moment.

From the VT stator, the phase-stabilized reference sinusoidal voltages are fed to the synchronization unit to the electronic circuit for generating code pulses to start the transmitter.

In the electronic circuit of the synchronization unit, sinusoidal voltages are fed to the control grids of the amplifiers of the limiters 36L1 and 36L9. In the anode of the second amplifier stages, differentiating transformers 36 Tr2 and 36 Tr4 are included.

Reference pulses of positive polarity with a duration of about 600 μsec are removed from their secondary windings, corresponding to the phases of 0, 90, 180 and 270 degrees of the GON reference voltage and fed to the control grids of the reference voltage amplifiers 36L2, 36L4, 36L10, 36L12 (left halves).


БЛОК СИНХРОНИЗАЦИИ ЦД-36ТМ
КОММУТАЦИОННАЯ КОРОБКА ЦД 42ТМ
Передатчик ЦД 32Т
АНТЕННА ЦД-31
БЛОК СТАБИЛИЗАЦИИ ЦД-39А
+250 в
-250 в

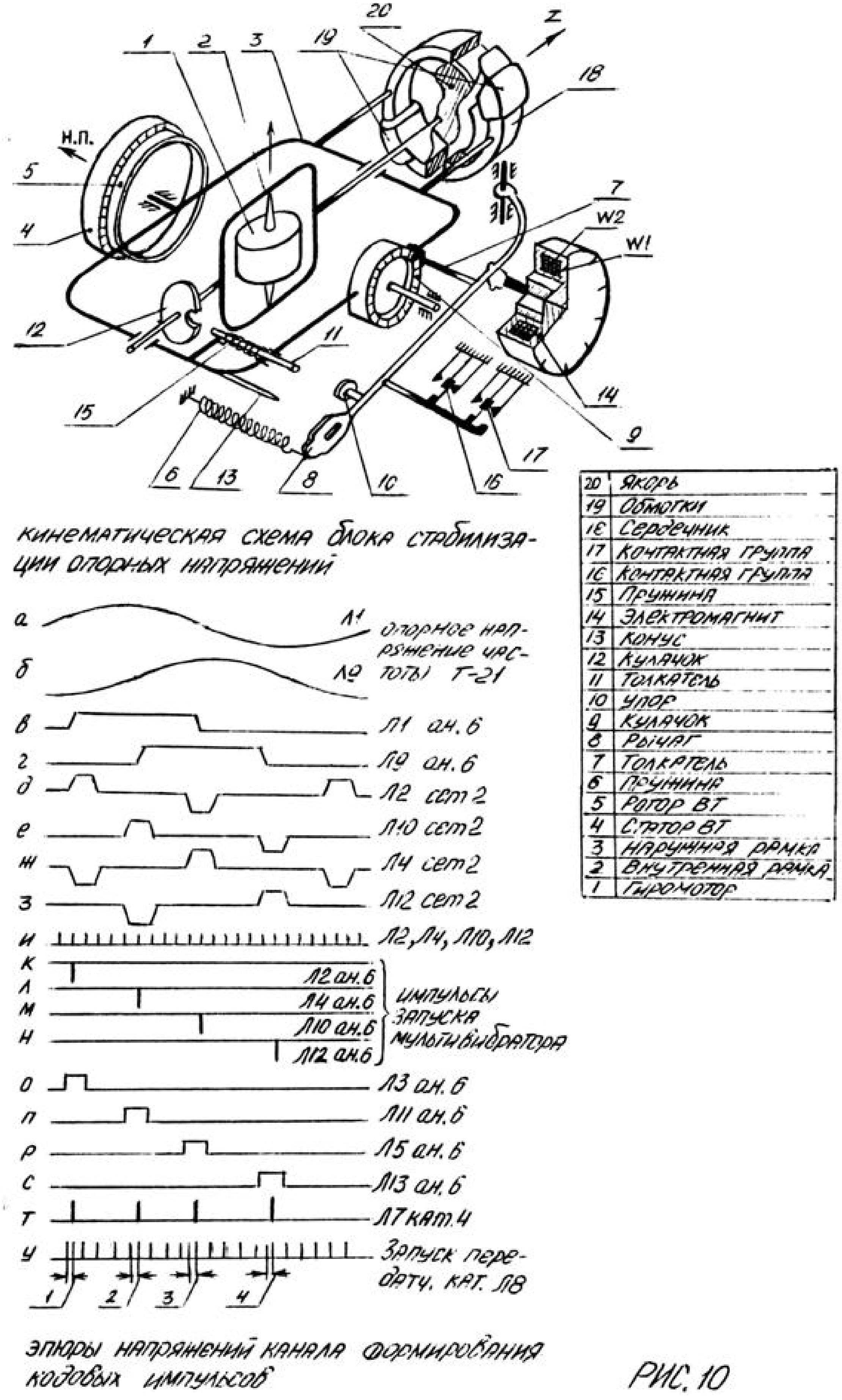


РИС. 10

Reinforced reference voltages of negative polarity are applied to the cathodes of the coincidence stages 36P2, 36P4, 36P10, 36SH2 (right halves), opening them. Repetition frequency pulses are fed to the control grids of the coincidence cascade lamps. The first pulse that passed through the coincidence cascades triggers the multivibrators 36LZ, 36P5, 36L11, 36L13. Pulses of positive, polarity and duration of 700 μs from the anodes of the multivibrators are fed to the control grids of the second coincidence stages 36L6, 36L14 (both grids), pulses delayed relative to the pulses of the repetition rate by 2.3.4 are fed to the same lamps from the delay line 36LZ-1 and 5μs. When the pulses coming from the delay line coincide with the pulses of the multivibrators, the 36L7 blocking generator (left half) is started.

one 2 3 4 five